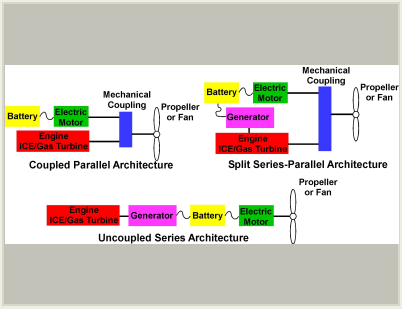
Modular Electric Propulsion Test Bed Aircraft, Phase II

Completed Technology Project (2014 - 2016)

Project Introduction

A hybrid electric aircraft simulation system and test bed is proposed to provide a dedicated development environment for the rigorous study and advancement of hybrid electric powered aircraft. The new test bed and simulation system will provide a dedicated platform and set of analysis tools to study, design, and test hybrid electric powered propulsion components and systems for use in commercial, general aviation, military, and UAV systems. The test bed will allow various hybrid electric propulsion system technologies to be tested to determine performance, reliability, safety, and cost. These include various motors, motor controllers,gas turbines, batteries, fuel cells, super capacitors, propeller, and fan technologies. Additionally, the platform could be used to investigate performance characteristics unique to hybrid electric propulsion, determine the most accurate methods for measuring energy used and remaining, and research redundancy possibilities unique to hybrid electric aircraft. Studies performed during Phase I demonstrated that pure electric aircraft are limited in range and endurance by the specific energy of current battery technology. Although there is a great deal of effort being put into advanced batteries, the most practical solution in the near term is to utilize a hybrid electric system. The proposed Phase II program builds upon the Phase I results by developing a detailed propulsion system simulator model for hybrid electric propulsion systems, with the ultimate goal of a bench test model of the propulsion system. Using a detailed multi-platform/mission trade study, a coupled parallel, uncoupled series, and split series-parallel hybrid system architecture will be compared to determine the most advantageous and efficient. The propulsion system simulator will also be used to perform a sensitivity analysis of each architecture to determine critical performance aspects for individual components.



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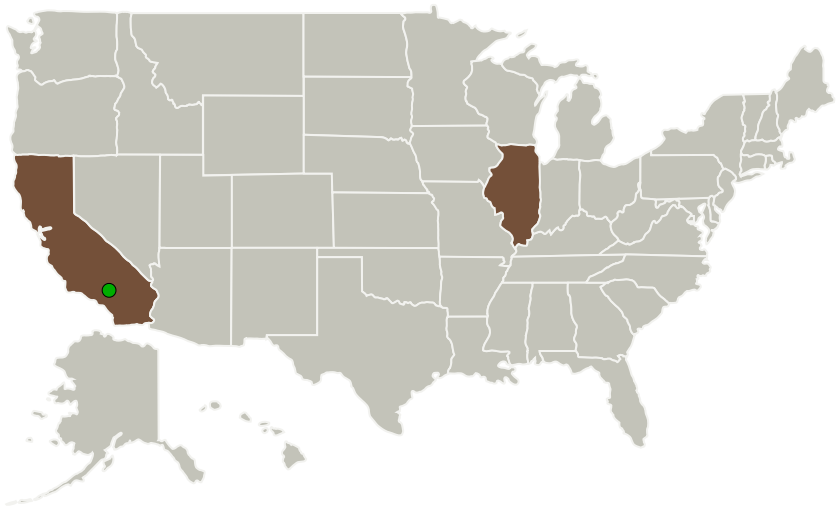
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Rolling Hills Research Corporation	Lead Organization	Industry	El Segundo, California
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
Board of Trustees of the University of Illinois	Supporting Organization	Academia	Champaign, Illinois

Primary U.S. Work Locations	
California	Illinois

Project Transitions

September 2014: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Rolling Hills Research Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brian R Kramer

Co-Investigator:

Brian Kramer

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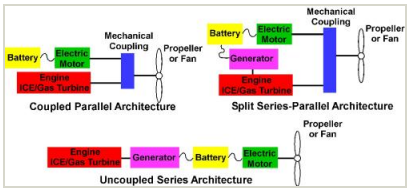
December 2016: Closed out

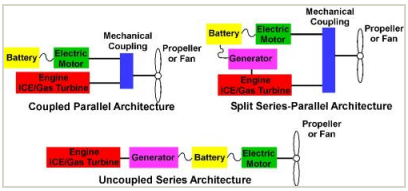
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137524)*

Images



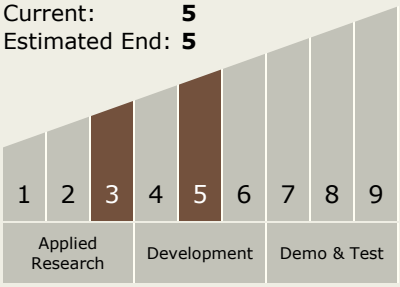
Briefing Chart Image
Modular Electric Propulsion Test Bed Aircraft, Phase II *(https://techport.nasa.gov/image/133091)*



Final Summary Chart Image
Modular Electric Propulsion Test Bed Aircraft, Phase II Project Image *(https://techport.nasa.gov/image/132034)*

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.3 System Integration and Analysis for EDL

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System